Willow Short Rotation Coppice in Multiple Land Use Systems:
a survey of potentials in the Netherlands

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In densely populated regions such as Western Europe, the introduction of dedicated energy cropping is hampered by current intensive land use and corresponding high land prices. Possibly, multiple land use is a strategy to overcome this problem: combining energy cropping to other functions may generate more value added per ha of land and thereby reduces costs. Many combination options have been proposed: in this paper we examine nine options on a set of nine feasibility criteria. This analysis can help identify most promising options for further research and implementation.

A longlist of proposed combination options can be found in Heineman et al. [1]. Börjesson [2, 3] evaluated a number of these options on their potential land area and financial benefit. In this paper we explore a number of other options, selected on data availability the author's expectations on combination relevance. The options were:

?? Willow SRC in groundwater extraction areas for drinking water production;
?? Willow SRC in groundwater protection areas for drinking water production;
?? Willow SRC in moist hydrological buffer zones around groundwater-dependent nature reserves;
?? Willow SRC on traditional willow coppice lands;
?? Willow SRC as extensive land farming of contaminated river sediments (sludges);
?? Willow SRC as an ecological corridor
?? Willow SRC in recreation areas

The following *criteria* were set up for assessment of the potentials of the combinations (see Table 1):

?? Technical feasibility. Each function has land use requirements. If these are compatible to those of willow SRC, or with limited adaptation, we assume the combination to be technically feasible.
?? Feasibility certainty indicates whether this compatibility is relatively certain (e.g. when land use requirements of both functions are well known and supported by field data), or whether requirements and compatibility are based on an indicative assessment.
?? Feasibility can be more certain when successful practical experiments have been carried out in the Netherlands in which compatibility has been proven.
?? Another criterion is whether the function combination can be more cost-effective than separated fulfilment. We express this effect by a willow wood price reduction estimate, assuming that all financial benefits of the combination are allocated to the wood production function.
?? Reduction certainty indicates whether this estimate is based on sound data or on a rough guess.
?? The potential area indication is based on the spatial claim of the co-function;
?? Potential area certainty depends on the soundness of the underlying data, and whether this area is currently in use by the co-function or still needs to be obtained.
?? Finally, the occurrence of a number of potential implementation problems, specific for the combined system, is also indicated in Table 1.

Most presented options are technically feasible. However, financial benefits in terms of an expected lower wood production price do not always occur, such as in groundwater protection areas. The potential areas are generally in the order of thousands of hectares, except for the groundwater protection areas and the moist hydrological buffer zones. The latter mostly still need to be established, being insecure to what extent they will be introduced.

Table 1: Nine combination options evaluated on nine feasibility criteria. See text for details.

Combination / criterion	Technical feasibility	Feasibility certainty	Successful experiments in NL?	Price reduction energy wood[2]	Financial benefit certainty	Potential area (ha)	Certainty of potential area	Implementation problems	References
Groundwater extraction areas	+	+	Y	+	+/-	5,000	+		[4, 5]
Groundwater protection areas	+	+	N	0	+	71,000	+	S	[4]
Moist hydrological buffer zones	+	+	N	+	+	20,000	-	LN	[6, 7]
On contaminated sludges	+	+	Y	++	+	3,000		A	[8, 9]
Traditional willow coppice lands[1] 1	+	+	N	0		1,000	+	AS	[4]
2	-	-	N	+	-				
In ecological corridors	+	-	N	?		2,000	-	LNS	[4]
In recreational areas	+/-	-	N	?		?		NS	

[1]: 1 is traditional coppice with current manual harvest; 2 is modernised coppice with mechanical harvest.

[2]: Legend: -: no reduction; +: 0-50%, ++: 50-100%, all compared to single land use willow SRC production prices.

[3]: Implementation problems:
A: Societal acceptance can be a problem; L: Location of the areas insecure and subject to debate.
N: Number of actors may frustrate implementation; S: Relevant areas are scattered (<10 ha)

Table 1 gives a complicated image of which option have the best chances. However, given the governmental renewable energy targets and the projected 30,000 ha demand area for energy farming [10], the combination options can contribute to a significant part of this area.

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